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FCC ROUNDTABLE ON
THE ECONOMICS OF MERGERS BETWEEN LARGE ILECS
Friday, February 5, 1999
The Commission Meeting Room
The Portals II, 445 12th St. S.W., Washington, DC

ROUNDTABLE PARTICIPANTS

Moderator: William Rogerson, Chief Economist, FCC
Panelists: Dennis Carlton, University of Chicago
Robert Crandall, Brookings Institution
Joseph Farrell, UC Berkeley
Robert Gertner, University of Chicago
Richard Gilbert, UC Berkeley
Michael Katz, UC Berkeley
Robert Litan, Brookings Institution
Roger Noll, Stanford University
William Sheperd, University of Massachusetts

AGENDA

9:00 - 9:15 **Welcome**

9:15 - 10:00 **Session 1** **Potential Benefits of the Mergers**

5 minutes of opening remarks by Dennis Carlton, Robert Gertner and Roger Noll

10:00 - 10:45 **Session 2** **Effects on Benchmarking/Diversity**

5 minutes of opening remarks by Joseph Farrell, Robert Crandall, and Dennis Carlton

10:45 - 11:00 **Break**

11:00 - 11:45 **Session 3** **Effects on Actual and Potential Competition**

5 minutes of opening remarks by Robert Litan, William Sheperd, and Richard Gilbert

11:45 - 12:30 **Session 4** **Effects on Ability and Incentive of ILECs to Raise Rivals' Costs**

5 minutes of opening remarks by Michael Katz and Dennis Carlton

12:30 - 12:45 **Session 5** **Conclusions and Final Remarks**

FCC ROUNDTABLE ON

THE ECONOMICS OF MERGERS BETWEEN LARGE ILECS

February 5, 1999

Press Statement of

Robert W. Crandall

The Brookings Institution

Any analysis of the likely effects of the Bell Atlantic-GTE merger must account for the current environment in the U.S. telecommunications sector. The 1996 Act has unleashed market forces that had been restrained for decades by state regulators. The structure of local access-exchange markets was also influenced heavily by the 1982 AT&T decree that was only recently vacated by the 1996 Act. Given the rapid technological change that has engulfed this sector, the proliferation of new services, and the heritage of decades of regulation, the entire sector is clearly in a situation of considerable disequilibrium. The large number of mergers since the passage of the 1996 Act must be seen as attempts by market participants to position themselves for a new equilibrium characterized by more intense competition.

Benefits of the Merger

Whenever an industry emerges from a long period of regulation, market participants are forced to adjust to new market realities. Incumbent firms, unaccustomed to competitive rivalry, are forced to adjust to new rivals' product offerings and technologies. In the case of incumbent local exchange carriers (ILECs), this requires the adjustment of facilities, personnel, and even market boundaries in order to compete successfully with firms that are unencumbered by the heritage of decades of regulation. This heritage includes the drawing of geographic franchise boundaries, the need to cross-subsidize unprofitable services, and the regulatory requirement to depreciate facilities more slowly than the rapid change in technology would imply. Decisions made to comply with past regulation are not likely to prove universally efficacious in competing in this new environment.

It is not surprising, therefore, that telecommunications firms are struggling to recast themselves to be able to compete in an era of open entry. AT&T has made several rather unsuccessful attempts to recast itself as a full-service telecommunications company, and only recently has bought the country's largest cable company, TCI, one of the largest Competitive Access Providers (CAPs), TCG, and IBM's Internet operations. AT&T has also announced a joint venture with Time Warner for cable telephony. MCI WorldCom is obviously the product of many large mergers. Frontier, once Rochester Telephone, has been active in making acquisitions and new investments to be able to compete in this new environment.

The LEC sector is still heavily regulated, but it is now being buffeted by new entry from firms who are largely unregulated. With franchise areas that are the product of decades of

Will the Merger Lessen Competition?

Neither Bell Atlantic-GTE nor SBC-Ameritech is a horizontal merger. Neither pair of merging firms' local service areas overlap. However, both mergers combine some local operations in geographically adjacent areas, giving rise to putative concerns about potential competition. Most of the remaining concerns expressed about the effect of these mergers involve the possibility of increased coordination among market participants, price squeezes, potential vertical foreclosure, and the loss of information for regulatory benchmarking. None of these concerns is of much importance.

1. Potential competition. In its 1997 Bell Atlantic-NYNEX decision, the Commission expressed concern that the merger of these two ILECs reduced the number of "significant" sources of entry into local services in LATA 132 from four to three because the Commission concluded that large, adjacent ILECs (not SNET) and the three large IXCs were the most "significant" likely new entrants. Given the dispersed nature of GTE's local-exchange operations, it would not qualify as a significant potential entrant into any of Bell Atlantic's current local-service markets.

It is far from clear, however, that the universe of potential entrants can be so precisely delimited. Given recent developments in wireless technology and the sharp decline in wireless rates, for instance, it would seem appropriate to include wireless carriers in this group. Moreover, given AT&T's $32 billion purchase of TCI as its vehicle for local entry and its alliance with Time Warner, surely the nation's largest cable MSOs should be prominent in this list. Finally, the list should include non-adjacent LECs given SBC-Ameritech's and Bell Atlantic-GTE's plans to enter out of region in non-adjacent markets. Given the abundance of large, potential entrants in these categories, it is very difficult to see how either merger meaningfully reduces the number of "significant" participants in the relevant markets. Surely, the Commission has no evidence from its survey of local competition that adjacent ILECs have yet been a more significant source of such entry than are other types of potential entrants.

2. Increased coordination. In Bell Atlantic-NYNEX, the Commission concluded that the reduction of the number of "significant" market participants from five to four in LATA 132 or the New York metropolitan area risked increased coordination of pricing and output decisions among the remaining firms. Such coordination would appear very unlikely, however, given the rapid pace of technical change, the different strategies being employed by the large telecommunications firms, and the diversity of customers and services. Given that recent events now require the Commission to expand the number of significant participants, this concern -- even if it were valid in 1997 -- is simply not important today.

A variant of the increased coordination argument involves only the ILECs. By combining into two or three large companies with a national presence, the Regional Bell Operating Companies are alleged to be moving toward an equilibrium of mutual forbearance of entry. But if their success in establishing a national brand and national services requires such entry, such forbearance would hardly be in each merged company's best interest. Moreover, if others, such as AT&T-TCI, MCI WorldCom, Sprint, the national wireless companies, the large cable MSOs, and a variety of other CLECs such as Teligent, RCN, and Winstar are entering these local markets at an accelerating rate, why would any ILEC forbear at the cost of missed opportunities?

3. Vertical foreclosure. The one issue that has been raised most often in regulatory proceedings involving the RBOCs since 1984 is the possibility that they will exercise subtle forms of discrimination against unintegrated rivals in providing access to their local access/exchange facilities. There is no empirical support for these allegations, only the invocation of a theoretical possibility that they may occur -- with or without mergers. Katz and Salop allege that the two ILEC mergers we are considering today will increase these theoretical possibilities by "internalizing" the anticompetitive benefits that would otherwise accrue to an unrelated ILEC. There are serious theoretical problems with such assertions, as Schmalensee, Taylor, Crémer, and Laffont point out. More fundamentally, no one has shown that these theoretical possibilities actually occur in the real world. There is no evidence of which I am aware that the ILECs have been able to discriminate in favor of their wireless services or information services to frustrate competition in these markets. Nor is there evidence that unintegrated entrants are more likely to enter geographic markets served by a small ILEC than areas served by very large ones with the geographic footprints that so alarm Katz and Salop. For example, a perusal of the Commission's Industry Analysis Division Report, Local Competition, released this past December, shows that CLEC activity is much weaker in Sprint's ILEC territories than in the territories of the larger ILECs, such as SBC, Bell Atlantic, and Ameritech.

4. Price squeezes. The very notion that a price squeeze could be exercised successfully by one of the large ILECs or the combination of two ILECs in one of the mergers under consideration against well-capitalized rivals such as AT&T, Sprint, and MCI WorldCom would seem preposterous. In antitrust lore, price squeezes occurred when an industrial giant, such as ALCOA, sold its basic industrial output to several downstream markets. By charging prices that varied inversely with the price elasticity of demand, such a monopolist could increase its profits and increase economic welfare. Because such discrimination could be thwarted by arbitrage, the monopolist sold into the market with low price-elasticity of demand and produced the other product itself. This practice was objected to by prospective rivals in the latter market as a price squeeze because they could not compete when paying the high price charged for the basic material in the former market.

In telecommunications, long-distance companies make a different argument concerning a price squeeze. They allege that, as long as access charges are above incremental cost, an ILEC will use a lower price of access in pricing its downstream services than it charges its rivals. This will "squeeze" the rivals, presumably damaging competition in the downstream market and driving its downstream rivals out of business. This is not a "price squeeze" per se, but rather an attempt at predatory pricing which is precluded by imputation safeguards in the regulatory process. Professor Arrow has forcefully made this point in the Bell Atlantic-GTE proceeding. No

STATEMENT OF JOSEPH FARRELL

Before the Federal Communications Commission
Roundtable Discussion of ILEC Mergers
Washington, D.C.

February 5, 1999

My name is Joseph Farrell. I am a Professor of Economics at the University of California at Berkeley. I served as Chief Economist of the Federal Communications Commission (FCC) in 1996 and 1997 and have advised the Department of Justice on antitrust policy. I believe that the pending mergers between Ameritech and SBC and between Bell Atlantic and GTE would hamper regulators' use of a key tool that helps make phone regulation more efficient.

In October of last year, on behalf of Sprint Communications Company, L.P., I co-authored a study with telecommunications expert Dr. Bridger Mitchell of how telephone regulators use comparative "benchmarking" across the big near-monopoly telephone companies and how this important tool is blunted by mergers among those companies. We reviewed the role of benchmarking both in traditional telecommunications regulatory activities (such as ratesetting and universal service) and in the active promotion of competition called for in the Telecommunications Act of 1996. As has been widely recognized in the United States and internationally, benchmarking is a powerful and beneficial tool in a wide variety of such contexts. For example, regulators can use experience in other jurisdictions to set service quality standards, or can require all companies to adopt the best practices for connecting to competitors' networks.

Our study showed how benchmarking puts large telephone companies into competition-by-comparison even if they do not compete directly for each other's customers. The proposed mergers would reduce this kind of competition, in much the same way as a merger between firms that compete to sell products to the same customers reduces regular competition.

Comparing regulated firms' performance against each other is a "used and useful" technique for ensuring that consumers and competitors get a fair deal while encouraging the monopolies to operate efficiently. However, when the number of large local telephone companies goes from eight to six to four, those comparisons inevitably get weaker and more tentative. Then regulators either have to give the firms a lot of slack, which would be premature given the slow growth of real local phone competition, or else clamp down in traditional green-eyeshade regulatory ways that are liable to retard innovation and productivity growth.

Our study also considered that private firms can and do compare ILECs against one another. Customers and suppliers of complements (such as long distance companies), as well as nascent competitors, will "benchmark" the ILECs' proposals and performances to produce more efficient outcomes.

Mergers among large ILECs significantly weaken the power and effectiveness of benchmarking. Until 1996 there were seven regional Bell companies plus GTE; mergers between SBC and PacBell and between Bell Atlantic and Nynex have already taken place. The loss of even one of the relative handful of large ILECs would substantially damage efficient regulation, including the interconnection regulation necessary for the growth of competition in local exchange markets.

FCC ROUNDTABLE ON
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February 5, 1999

Press Statement of

Robert Gertner

University of Chicago Graduate School of Business

and

Lexecon Inc.

The telecommunications marketplace is changing rapidly. Deregulation and new technology are transforming the industry. Not surprisingly, other industries facing such fundamental shifts have seen major changes in the identity, scope and scale of competitors. These changes are characteristic of deregulated industries such as airlines, trucking, and energy as well as technologically dynamic industries such as computer software and hardware and telecommunications equipment. Many of these changes include significant consolidation through mergers and acquisition. Competitive adaptation to such a changing environment is fundamental for achieving economic efficiency. This is especially true in industries such as local telecommunications where the geographical and product scope of the companies has been determined by regulation rather than market forces. Certainly, proposed mergers must be analyzed carefully by regulatory authorities for potential anticompetitive effects, but regulators should be mindful of the value of competitive responses to a changing environment.

These mergers are between large companies. Although this may make some people worry, it is widely accepted that "big is bad" is a flawed way to think about mergers. Instead, we must evaluate carefully the likely impact of the mergers on competition and consumers.

Opponents to the mergers present a variety of objections to both proposed transactions, but their economic arguments lack empirical support. A careful analysis of the institutional and competitive environments in which these firms compete shows that opponents' concerns are not economically significant.

On the other hand, the procompetitive strategic rationales for the mergers are strong. I am more familiar with the details of the Bell Atlantic-GTE merger, so I will focus on its procompetitive benefits. The most significant benefit follows from two simple premises that are widely accepted by all parties, including regulators and companies opposing these mergers.

The first premise is that the ability to provide facilities-based bundled services on a wide geographic scale is an important strategic asset for telecommunications providers. Indeed, the major opponents to these transactions are pursuing similar strategies in similar ways – by acquiring firms that will allow them to offer portfolios of telecommunications services on a national or near-national basis. For example, AT&T has recently completed several major acquisitions and announced a new business strategy based on offering bundled telecommunications services. The Federal Communications Commission ("the Commission") in these proceedings has acknowledged the importance of bundled services, and the pleadings include statements from many business customers that they value such services.

The second premise is that existing customer relationships provide an important competitive advantage in the evolving market. Wide-ranging evidence supports this view. The evidence includes: the costs incurred by interexchange carriers ("IXCs") and wireless carriers to induce customers to switch service; the difficulty GTE has had in selling services out of its local exchange region; consumer surveys; and the strategies adopted by numerous companies to sell new services to their existing customers or to make acquisitions to gain access to an expanded customer base. The Commission also agrees with this premise. For example, in the Bell Atlantic-NYNEX order the Commission argued that the major IXCs are among the most important potential competitors in local markets because of their existing customer bases and brand recognition.

The merger of Bell Atlantic and GTE will have significant procompetitive benefits. GTE's national facilities-based internet and data network and Bell Atlantic's customer base are strongly complementary assets. The combination of these two assets will create a strong facilities-based bundled services competitor. Furthermore, the merged firm will use GTE's existing presence in or near many geographically dispersed markets to facilitate timely and efficient entry. The benefits to consumers will include the presence of another national or near-national provider of bundled telecommunications services. This increased competition should result in lower prices and greater consumer choice. Businesses will be able to receive the same set of advanced services at all locations. They will be able to coordinate upgrades and service throughout their organizations with a single provider that understands their telecommunications needs. Consumers will be able to reduce transaction costs and coordination costs by having a single provider.

In addition to these benefits, the merger will result in significant cost savings. Bell Atlantic and GTE estimate that the merger will lead to $ 2 billion in annual cost savings within three years of the merger. Regulators are often skeptical of cost savings estimates from mergers. In these mergers, there is an important reason to be much less skeptical – both Bell Atlantic and SBC have completed major mergers (with NYNEX and PacTel, respectively) and each has documented that the anticipated cost savings have been achieved.

These procompetitive benefits could not be achieved without a merger. An effective combination of GTE's network assets and geographical presence with Bell Atlantic's customer base and reputation requires a great deal of investment and complex coordination. Among the decisions that must be made are where to build points of presence on the network, what sets of services to offer, and what prices to charge. It would be difficult to delegate these decisions to one party and maintain incentives to share information effectively, coordinate strategies, and make efficient decisions. Thus, Bell Atlantic as a reseller of GTE services could not achieve the necessary level of coordination and integration. Although a joint venture might be able to achieve some (but only some) of these benefits, the parties would have to make these key decisions jointly, so the effect on competition would likely be the same as a merger. In addition, most of the anticipated cost savings from the merger result from combining operations that could not be accomplished without a merger.

I will contrast these benefits with the potential anticompetitive harms that opponents of the merger have identified. They fall into three categories: loss of significant potential competitors in local markets; loss of regulatory efficacy, and vertical foreclosure.

The loss of a potential competitor is significant only if there are no other similarly (or better) positioned potential competitors. Three characteristics have been suggested that may give one merging party an advantage in its partner's territory: proximity, brand name, and experience as an incumbent local exchange carrier ("ILEC"). For the most part, Bell Atlantic and GTE's local service areas are in different parts of the country. In the few areas where the two firms are contiguous (primarily in parts of Pennsylvania and Virginia), there are numerous other similarly situated local service providers. AT&T claims that companies can serve customers within a 125-mile radius of their existing switches. But 100 percent of the population in GTE's service area that is within 125 miles of a Bell Atlantic switch also is within 125 miles of at least ten other firms' switches. Furthermore, ILECs have no greater expertise than competitive local exchange carriers ("CLECs"); and brand name recognition provides limited value if not coupled with experience of the company's products. The potential competition issues do not come close to those in LATA 132, the only place where the Commission decided that the Bell Atlantic-NYNEX merger created potential competition problems.

Opponents also argue that the mergers will reduce regulatory efficacy through the loss of valuable benchmarks. However, none of the opponents empirically estimates the costs to consumers from lost regulatory efficacy. A close look at how benchmarks are being used currently indicates that the proposed mergers will not substantially hinder regulators. In particular, the 1996 Act shifts the regulatory focus to comparisons of how an ILEC treats itself versus competitors. Such comparisons are unaffected by the proposed mergers – in effect, each company serves as its own benchmark.

In the Bell Atlantic-NYNEX order, the Commission identified two areas where it thought regulatory efficacy could be reduced from major ILEC mergers. These two areas were X-Factor determination for price caps and collocation. The concern with X-Factor calculations is that increased concentration reduces the incentive to invest in productivity improvements because a greater fraction of the improvements will be given back when the X-Factor is recalculated – this is known as the "ratchet effect". However, this claim ignores regulators' ability to respond to changes in the competitive environment. Furthermore, opponents ignore mergers' effects on incentives to increase productivity.

There is a simple way to eliminate the ratchet effect from increased concentration – only include other firms' productivity in determining a firm's X-Factor. Even if this is not done, the overall incentives to invest in productivity likely are increased by the mergers. If productivity improvements involve incurring a fixed cost to reduce marginal costs, then the increased scale from a merger increases productivity incentives, which can swamp the ratchet effect. If, on the other hand, productivity improvements involve incurring a per unit charge today to reduce per unit costs over many periods, the incentives to innovate may still increase from the merger. This is because the initial capital investment costs are included in the total factor productivity analysis that determines the X-Factor. For example, the cost savings resulting from the Bell

Atlantic–NYNEX merger will presumably be incorporated in subsequent X-Factor calculations, resulting in lower price caps.

Collocation issues can be monitored effectively by regulators and by CLECs seeking collocation. Because these agreements are reached at the state level, and because they are observed by other state and federal regulators, it is not clear that a change in holding-company ownership would have any effect on the number of benchmarks. In addition, it is important to keep in mind that Bell Atlantic must get section 271 approval to obtain many of the benefits from the merger. Thus, it has a very strong incentive to comply with all elements of the Commission checklist, including collocation.

Opponents also rely on theories of "raising rivals' costs" or vertical foreclosure. Katz and Salop try to revive an anticompetitive argument that has been rejected by the Commission. They do so with theoretical arguments, but no empirical support. Indeed, the economic evidence is inconsistent with these arguments. Katz and Salop argue that the proposed mergers will increase incentives to discriminate against rivals because the merged firm would capture a larger portion of the purported benefits associated with discrimination. If ILECs are able to discriminate, then Katz and Salop's theory implies that today's larger ILECs discriminate against rivals more than today's smaller ILECs. This does not seem to be the case. Furthermore, in the wireless industry – where the Katz and Salop theory should produce the largest possible effect because the ILEC captures all the benefits of discrimination against non-ILEC rivals – there is no evidence of such discrimination. Indeed, the willingness of ILECs to sell their wireless properties is inconsistent with the Katz and Salop claim.

Finally, access discrimination is illegal. Regulators and rivals monitor ILECs to prevent discrimination. The penalties for discrimination are potentially severe. For example, in addition to normal regulatory sanctions, firms seeking section 271 approval risk losing that approval if they discriminate.

The procompetitive benefits of these mergers are clear. It would be unwise to forgo these benefits because of potential harms that are unlikely, and for which there is no empirical support.

STATEMENT OF PROFESSOR MICHAEL L. KATZ

FCC ROUNDTABLE ON THE ECONOMICS OF MERGERS BETWEEN LARGE ILECs

5 February 1999

I. INTRODUCTION

My name is Michael L. Katz. I am the Edward J. and Mollie Arnold Professor of Business Administration at the University of California at Berkeley. I hold a joint appointment in the Haas School of Business Administration and the Department of Economics. I serve as the Director of the Center for Telecommunications and Digital Convergence at the University of California at Berkeley. I specialize in the economics of industrial organization, which includes the study of antitrust and regulatory policies. I regularly teach courses on microeconomics, business strategy, and telecommunications policy. In addition to my academic experience, I have served as a consultant to both the U.S. Department of Justice and the Federal Communications Commission (the Commission) on issues of public policy in telecommunications markets. In 1994 and 1995, I served as Chief Economist of the Commission. In this statement, I examine how, if allowed, the proposed mergers between large ILECs would increase both the abilities and incentives of these carriers to weaken competition.

II. THE PROPOSED ILEC MERGERS POSE SIGNIFICANT THREATS TO TELECOMMUNICATIONS COMPETITION

This section briefly outlines the factual and logical analyses underlying the conclusion that the proposed mergers pose significant threats to telecommunications competition and thus to the public interest. Harm to *competitors* is not the source of harm to the public interest. Rather, by raising rivals' costs and degrading their ability to offer high-quality and innovative services, the mergers will weaken *competition,* and telecommunications consumers will be harmed.

- **Incumbent LECs possess significant market power in the provision of access services to their actual and potential rivals.** Local and long distance competitors depend on ILEC access services, including unbundled network elements, interconnection (both at the network and OSS levels), and various forms of originating and terminating access services. Competitors will need an array of new and innovative forms of access in the future. ILEC market power may be exercised by setting high access prices (in the absence of price regulation) or by pursuing exclusionary access policies that deny, delay, or degrade the access provided to competing carriers.

- **Regulation is an imperfect check on the exercise of ILEC market power.** At best, regulation is a slow and imperfect process. These limitations reflect the difficult nature of the regulator's problem. The roll out of xDSL offers several examples of how it is hard to distinguish ILEC misdeeds from difficulties inherent in implementing new technologies. In part by weakening benchmarks, the proposed merger would make it even more difficult for state and federal policy makers to prevent ILECs from refusing to provide efficient, high-quality and innovative access at reasonable prices.

- **Exercise of ILEC market power in the provision of access will significantly weaken competition.** Local and long distance carriers will continue to depend on ILEC access services to compete. ILEC conduct that impairs rivals' quality, raises their costs, or slows their entry or expansion harms the public interest. Consumer welfare is reduced even if ILEC practices do not completely drive the rivals from the market.

- **There are significant competitive spillovers across ILEC regions.** This conclusion follows from two key facts. First, national rivals are the strongest competitive threats to the ILECs. Second, there are significant benefits to national scope, so that weakening a rival's ability to compete in one region will weaken its ability to compete in other regions as well. These effects arise due to the presence of:

    — Network effects at the subscriber level.

    — Network effects at the third-party supplier level.

    — Word-of-mouth networks.

    — Economies of scale and scope.

- **The proposed ILEC mergers would increase the merging parties' incentives and abilities to exercise their market power.** By permitting effective coordination between what are today separate and independent local exchange operations, the proposed ILEC mergers would increase the merging parties' incentives and abilities to disadvantage local and long distance rivals by reducing ILECs' provision of the high-quality, efficient, and innovative forms of access that competitors will require.

The proposed mergers thus pose significant threats to telecommunications competition and the public interest.

III. MERGER PROPONENTS HAVE RAISED INVALID OBJECTIONS TO THIS ANALYSIS

The parties have put forth several claims that do not stand up to logical or factual scrutiny. Here, I only have time to hit on some of the highlights:

- The ILECs claim that if consumers and rivals can observe poor performance, then so can regulators. But the question is not whether ILEC performance is observable; the question is whether regulators can distinguish strategic behavior from technical limitations from plain old incompetence. For example, CLEC-ILEC OSS interfaces perform worse than ILEC internal OSS interfaces. Is this inherent in current technology and systems, or is it due to ILEC strategic behavior? The fact is that ILECs have scope to engage in anticompetitive behavior.

- The ILECs claim that, once the costs of entry have been sunk, a rival's competitive behavior cannot be affected. The fact is that an ILEC has incentives to engage in anticompetitive behavior against a current rival to: (a) deter additional investment by that rival, or (b) deter future entry by additional carriers. Indeed, sunk costs make entry riskier and can increase the power of ILEC exclusionary behavior.

- The ILECs claim that competitive spillovers across ILEC regions are negative because deterring entry in one region increases the threat of entry in other regions. The fact is that the most significant players are planning national coverage. Carriers are doing this in order to develop network effects, offer geographic one-stop shopping, use national media, and enjoy economies of scale in systems development. Weakening these rivals in one region weakens them overall and reduces the threat of entry and competition faced by ILECs in other regions.

- The ILECs claim that regulation works so well that there is no scope to engage in exclusionary behavior. The fact is that numerous instances at the state and federal levels demonstrate that ILECs can and do attempt to slow competition. These instances may be only the tip of the iceberg. Presumably the fact that ILECs try indicates that they believe they have a chance of getting away with it. The ILECs also make a variant of this argument when they claim that the interLATA carrot deters bad behavior. But one only has to look at the state of §271 applications to see that this argument doesn't hold water: the RBOCs have not been given sufficient incentives to induce compliance with the checklist to date. This is not entirely surprising: the data show that local margins are large relative to long distance margins for business lines. Thus, the prospect of interLATA authority cannot be expected to eliminate RBOC exclusionary behavior.

FCC Roundtable on the Economics of Mergers Between Large ILECs
Outline of Remarks by Robert E. Litan[1]
Session 3: Loss of Actual and/or Potential Competition

1. The legal standard: the FCC's "public interest" test

   a. DOJ test – "reasonable probability" that the mergers would "substantially lessen competition"; or
   b. Something different? It makes a difference which, if any, of these standards should apply

      --reasonable likelihood that the mergers would just lessen competition (something less than a "substantiality" test)
      --the mergers *may be pro*competitive (a bit stronger test)
      --the mergers are *likely to be pro*competitive (a much stronger test)

   c. If any of the above standards would rule out the mergers, can they be saved by appropriate conditions?

2. Any problems relating to *actual competition* are likely to be minimal and easy to fix under any of the standards

   --probably the only area of overlap is wireless, and if there are insufficient numbers of other competitors in some geographic areas, the problems should be fixed with divestitures, as was true with Worldcom/MCI

3. The loss of *potential competition* is the more important issue in these cases. Three key questions:

   a. The extent of competition in the market (for telephone service, and in many areas for cable TV, there is a monopoly or something very close to it, which makes the presence or absence of potential competition important)
   b. The number of significant potential entrants post-merger
   c. Would any of the parties have been the *most likely*, *successful* entrants? (The result here rests heavily on corporate internal documents which I have not seen)
   d. Note: DOJ has not won on this theory, but it hasn't been tested under monopoly conditions. In addition, the FCC has already recognized (in Bell Atlantic/Nynex, if not other circumstances) that potential competition is relevant to whether or not the merger is in the public interest.

4. The markets (see next chart)

   a. POTS
   b. TV

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[1] Director of Economic Studies and Cabot Family Chairholder in Economics at the Brookings Institutions.

c. Broadband or advanced services (POTS, TV, high-speed data)
d. Bottom line:

--loss of potential entry could most be significant for Ameritech/SBC in the TV market if documents indicate Ameritech planned to enter in SBC region
--significance of less entry in POTS depends on which legal test is used for defining the "public interest" standard

5. SBC's proposal to enter other local markets post-merger (can it salvage any loss of potential competition in Ameritech's markets and its own?)

   a. No evidence that merger is required to achieve entry in other markets
   b. In principle, could impose a hold-separate order, or not act on the merger, until SBC follows through on its promise (but what happens if SBC later withdraws in any market? What's the relevant test for "entry"?).
   c. Allowing the merger to go through now threatening divestiture later if local entry is not achieved is not a realistic threat (also measurement issues)

6. Conditions that might help open up the local markets in the affected regions and thus possibly offset any loss of potential competition through the mergers?

   a. Notwithstanding the Supreme Court's recent ruling in the AT&T case, the FCC could impose TSLRIC pricing on multiple UNE platforms (analogous to rules imposed in connection with Bell Atlantic/Nynex)
   b. It is not clear how much additional facilities-based competition this would lead to relative to the single UNE platform option that exists now, but it may be worth a try if mergers are permitted (note: many states at least in the Ameritech region have already done this, so the FCC's imposing it arguably would be redundant).

7. Last point: if these mergers aren't stopped, what is to stop all of the RBOCs from merging into a single nationwide RBOC? Is this what Congress had in mind when it passed the Telecomm Act of 1996?

Likely Potential Competitors, By Market, Post-Merger

	POTS	TV	Advanced Services
3 major IXCs	yes	ATT (others not clear)	ATT and others eventually
RBOCs/GTE	Only adjacent	Not likely	Only adjacent
Cable companies	Need telco for Switching	Already here	Need telco
CLECs	not significant	No	Rare
Electricity companies	Down the road	Down the road	Down the road
Wireless	Still cost difference	Satellite here, but needs local broad-cast	Untested, but eventually

Entry Planned Into Each Others' Market

Ameritech/SBC	Yes	Ameritech already in Illinois; entry in SBC area unknown	Not clear
Bell Atlantic/GTE	BA in VA/PA more Likely than GTE in Any BA	Unlikely	Unlikely
Bottom Line (in near Term)	4 to 3	Maybe 2.5 to 1.5	Not clear that either is a PE out-of-region

(Above analysis assumes that potential entry by other RBOCs into non-adjacent is unlikely)

Summary Statement: February 5, 1999
before the Federal Communications Commission
Economic Roundtable on Telecommunications Mergers

WILLIAM G. SHEPHERD
Professor of Economics, University of Massachusetts,
Amherst, MA

How the SBC-Ameritech Merger Will Probably Reduce Competition and Harm Consumers

Very probably, this merger will substantially reduce competition. It will frustrate the 1996 Telecommunications Act further and undercut the FCC's future role. It seems like a trial balloon, known to be unrealistic but tried anyway.

I. The Setting is Quite Unfavorable:

A. The 1990s merger binge:

1. The merger flood is far beyond past historic dimensions.
2. The best business and academic research says that most mergers are harmful rather than beneficial. The harm is to their own stockholders and company efficiency, as well as to the public interest.
3. Yet executives and merger promoters make rosy claims for the mergers' supposed benefits. The usual rhetoric cites both big dollar efficiency gains and claims that competition will actually increase.
4. Mergers often involve large costs that are not recognized when the merger is proposed and defended.

B. Telecoms Deregulation is Now at a Particularly Delicate and Unstable Phase:

1. Baby Bells have already become much too concentrated, by past mergers, especially Bell Atlantic-NYNEX.
2. Baby Bells resist new competition fiercely and effectively, all across the US.
3. There are some forces for competition, especially the long-distance firms. But whether a Schumpeterian dynamic process of competition will occur is doubtful.

C. Deregulation is a Long, Complicated Process:

1. It faces many troubles and dangers. The FCC must manage mergers very carefully in this industry, because they can interfere and stop the deregulation process.
2. Deregulation tends to go a little ways and then get stuck in a stable trap of single-firm market dominance. That is what much of the business press expects to happen to local-service markets, as Baby Bells keep overwhelming dominance.

<u>II. This Merger Seems Likely to Reduce Competition Substantially:</u>

A. The Merger Would Reduce Potential Competition:

The merger would strongly reduce potential competition among the Baby Bells, even more than the Bell Atlantic-NYNEX merger did. That is clear by the FCC's own 5 criteria about potential competition:

a. the target market is concentrated.
b. the merger partner is a leading potential entrant.
c. the merging partner was likely to enter.
d. the partner could enter by means other than the merger.
e. alternative entry would promote competition.

B. The Merger Would Reinforce Barriers:

Barriers against new competition are unusually high, and they will probably stay so even if the FCC takes a strong conditional approach in this case. The barriers include both objective facts (costs, brand advantages, inside information, etc.) and the many strategies and tactics that the monopolists can use in fighting entry.

C. The Merger Would Reinforce Local Monopoly:

Monopoly still persists in local-service markets throughout the SBC and Ameritech regions. It is shown by high market shares, high entry barriers and other conditions. There has been only a sprinkling of entry.

D. SBC's Plan to "Increase Competition" Warrants Little Weight:

SBC's claim that the merger will yield wholly-new entry into 31 cities is dubious. The greater size has not been proven to be necessary in order to obtain the future entry. Therefore, any entry would not be a <u>net</u> benefit of the merger. Also, the merged firm may be less efficient rather than more, because it may be <u>too</u> big.

E. The Merger Weakens Regulation:

The FCC's and state commissions' ability to regulate and protect competition and consumers will be substantially reduced.

SHORT BIOGRAPHICAL NOTE

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William G. Shepherd is a Professor (and formerly Department Chair) at the Department of Economics at the University of Massachusetts in Amherst. His research has explored many of the main topic areas within the field of Industrial Organization. He specializes in assessing market power, mergers, and the impacts of companies' actions on competition.

He is also the General Editor of the Review of Industrial Organization, a peer-reviewed research and public-policy journal on issues of competition and monopoly. The Review is produced by Kluwer Academic Publishers in eight issues per year.

In 1967-68 he was the personal economic adviser to the head of the Antitrust Division, Donald F. Turner, in the U.S. Department of Justice, involving work on numerous major cases.

In 1976 he was President of the Transport and Public Utilities Group of the American Economic Association, a professional organization concerned with regulation and deregulation. In 1996 this Group designated him a "Distinguished Member."

In 1990 he was President of the Industrial Organization Society, which publishes the Review.

He has published over 13 books and joint volumes, and some 90 articles in professional journals and chapters in other books. His textbooks cover the two main halves of the field: The Economics of Industrial Organization, 4th edition, 1997, and Public Policies Toward Business, 8th edition, 1991.

He has advised and testified frequently in antitrust and regulatory cases involving a wide range of industries, including telecommunications. The work usually focuses on defining markets, assessing the degree of competition, and evaluating possible anti-competitive actions and their effects.

His educational background includes Amherst College, BA. 1957, and Yale University, PhD. 1963, along with extensive international research. During 1963-1986 he was a senior faculty member in the University of Michigan Department of Economics at Ann Arbor.

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NSF Grant SES-8504304, "Moral Hazard, Reputation, and Product Quality,"April 1985 - September 1987
NSF Grant IRI-8705477, "Contracting Under Asymmetric Information,"July 1987 - December 1989
Named to Household International Professorship in Economics, September 1987 - August 1989
Lynde & Harry Bradley Foundation Research Grant, "An Economic Analysis of Defense Procurement Regulations," June 1989 - December 1991.
NSF Grant SES-8906751, "Profit Regulation of Defense Contractors," August 1, 1989 - July 31, 1991.

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Faculty Fellow, Center for Urban Affairs and Policy Research, Northwestern University, September 1991-August 1997.

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Employment History

Research Assistant to Canadian Member of Parliament, Arnold Malone, June 1975 - September 1975

Teaching Assistant at University of Alberta, September 1975 - June 1976

Economist, Department of Industry, Trade and Commerce, Government of Alberta,June 1976 - September 1976

Research Assistant, Environmental Quality Laboratory, Caltech, June 1977 - September 1977

Economist, Long Range Planning and Structural Analysis Division, Department of Finance, Government of Canada, June 1978 September 1978

Teaching Assistant to Professor Charles R. Plott, Division of Humanities and Social Sciences, Caltech, September 1979 - 1980

Assistant Professor of Economics, Stanford University, September 1980 - August 1984

Associate Professor of Economics, Northwestern University, September 1984 - May 1990

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Professional Activities

Editor of Defense and Peace Economics, January 1995 - December 1999.
Member of the editorial board of Defense and Peace Economics, September 1991 - present.
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Consultant to: Federal Trade Commission, Institute for Defense Analysis, Logistics Management Institute, Office of the Secretary of Defense (Program Analysis and Evaluation), RAND Corporation, US Department of Justice

Refereed Publications

"Aggregate Expected Consumer Surplus As a Welfare With an Application to Price Stabilization," Econometrica, 49, No. 2, (March 1980), pp. 423-436.
"Agriculture in Development: A Game-Theoretic Analysis," with Robert Bates, Public Choice, 35, (1980), pp. 513-527.
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Other Publications

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with Roger Noll, "The Economics of University Indirect Cost Reimbursement in Federal Research Grants," in Roger Noll, ed., Challenges to the Research University. Washington: Brookings Institution, 1997.

Recent Papers

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"The Use of Simple Menus of Contracts in Cost-Based Procurement and Regulation," mimeo.

Work in Progress

Economic Incentives and the Defense Procurement Process. Cambridge: Harvard University Press, manuscript in preparation.

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EMPLOYMENT

LEXECON INC., Chicago, Illinois (1977 - present): President, 1997 - present.

UNIVERSITY OF CHICAGO, Graduate School of Business (1984 - present): Professor of Economics.

UNIVERSITY OF CHICAGO, Law School (1980 - 1984): Professor of Economics.

UNIVERSITY OF CHICAGO, Department of Economics: Assistant Professor (1976 - 1979): Associate Professor (1979 - 1980).

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, Massachusetts, Department of Economics (1975 - 1976): Instructor in Economics.

OTHER PROFESSIONAL EXPERIENCE

HARVARD UNIVERSITY, Public Policy Summer Course in Economics (1977): Professor.

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National Science Foundation Fellowship, 1972 - 1975
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National Science Foundation Grant, 1977 - 1985
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Co-editor, Journal of Law and Economics, 1980 - present
Associate Editor, Regional Science and Urban Economics, 1987 - 1997
Associate Editor, The International Journal of Industrial Organization, 1991 - 1995
Member, American Economics Association, Econometrics Society
National Bureau of Economic Research, Research Associate
Member, Advisory Committee to the Bureau of the Census, 1987 - 1990
Editorial Board, Intellectual Property Fraud Reporter, 1990 - 1995
Consultant on Merger Guidelines to the U.S. Department of Justice, 1991 - 1992
Accreditation Committee, Graduate School of Business, Stanford University, 1995
Visiting Committee, Massachusetts Institute of Technology, Department of Economics, 1995 - present
Resident Scholar, Board of Governors of the Federal Reserve System, Summer, 1995
Member, Advisory Board, Economics Research Network, 1996 - present
Member, Steering Committee, Social Science Research Council, Program in Applied Economics, 1997 - 1999
Participant in meetings with Committee of the Federal Reserve on Payment Systems, June 5, 1997
Participant in round table discussions on "The Role of Classical Market Power in Joint Venture Analysis," before the Federal Trade Commission, November 19, 1997 and March 17, 1998.
Member, Advisory Board of Antitrust and Regulation Abstracts, Social Science Research Network, 1998 - present

BOOKS

"Market Behavior Under Uncertainty," Ph.D. Thesis, Massachusetts Institute of Technology (September 1975); Garland Publishing (1984).

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RESEARCH PAPERS

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"Vertical Integration in Competitive Markets Under Uncertainty," Journal of Industrial Economics, (March 1979). Awarded the P.W.S. Memorial Prize for the best essay in the field of Industrial Organization by a scholar under the age of thirty.

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"Merger Policy and Market Definition Under the EC Merger Regulation," Conference on Antitrust in a Global Economy, Fordham Corporate Law Institute, (1994).

"The Antitrust Economics of Credit Card Networks," (with A. Frankel) Antitrust Law Journal, (Winter 1995).

"Economic Organization and Conflict," Journal of Institutional and Theoretical Economics, (March 1995).

"Antitrust and Higher Education: Was There a Conspiracy to Restrict Financial Aid?" (with G. Bamberger and R. Epstein) The Rand Journal of Economics, (Vol. 26, No. 1, Spring 1995, pp. 131-147).

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"Antitrust and Payment Technologies," (with A. Frankel), Review, Federal Reserve Bank of St. Louis (November/December 1995).

"Antitrust Policy Toward Mergers When Firms Innovate: Should Antitrust Recognize the Doctrine of Innovation Markets?" Testimony before the Federal Trade Commission Hearings on Global and Innovation-based Competition (October, 1995).

"You Keep on Knocking But You Can't Come In: Evaluating Restrictions on Access to Input Joint Ventures," (with S. Salop), Harvard Journal of Law & Technology, (Volume 9, Summer, 1996).

"Comments on Causes and Consequences of Airline Fare Wars," Micro Brookings Papers on Economic Activity, (1996).

"A Critical Assessment of the Role of Imperfect Competition in Macroeconomics," in Market Behaviour and Macro Economic Modeling, Brakman, Van Ees, & Kuipers (eds.), MacMillan Press (1997).

"Price Rigidity," Business Cycles and Depressions, David Glasner ed., Garland Publishing, Inc., (1997).

"Communication Among Competitors: Game Theory and Antitrust," (with R. Gertner and A. Rosenfield), George Mason Law Review, (1997).

"Antitrust and Higher Education: MIT Financial Aid (1993)" (September 1997) (with G. Bamberger), The Antitrust Revolution, (Oxford University Press), 3rd edition (1999).

"An Analysis of the Toys 'R' Us Case," (with H. Sider), Forensic Economics, The Role of the Academic Economist in Litigation Support, edited by Daniel Slottje, North Holland, (1999).

UNPUBLISHED PAPERS

"Modeling the Housing Allowance Program," M.A. Thesis, Massachusetts Institute of Technology (September 1974).

"The Cost of Eliminating a Futures Market and The Effect of Inflation on Market Interrelationships," (1984).

"The Empirical Importance of Delivery Lags as an Explanation of Demand," (1984).

"Airline Networks and Fares," (with G. Bamberger), (1996).

"The Choice of Organizational Form in Gasoline Retailing and The Costs of Laws Limiting that Choice," (with A. Blass), (1996).

"Statistical Supplement to The Antitrust Economics of Credit Card Networks: Reply to Evans and Schmalensee Comment, 63 Antitrust Law Journal 903 (1995)," (with Alan Frankel), (May 1997).

"The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries," (with M. Waldman), Working Paper No. 145, George J. Stigler Center for the Study of the Economy and the State, University of Chicago (1998).

"Inferring Values from Jewish Attitudes Toward Competition," (with A. Weiss), presented at the International Conference on Law, Jewish Law and Economics, Bar-Ilan University, Israel, December 1998.

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Adjunct Associate Professor of Economics, George Washington University, 1975 - 1977
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Associate Professor of Economics, M.I.T., 1972 - 1974
Assistant Professor of Economics, M.I.T., 1966 - 1972
Johnson Research Fellow, The Brookings Institution, 1965 - 1966
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Consultant to Environmental Protection Agency, Antitrust Division Federal Trade Commission, Treasury Department, various years

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Ph.D., Economics, Northwestern University, 1968
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Changing the Rules: Technological Change, International Competition and Regulation in Communications. (Edited with Kenneth Flamm), Washington, DC: The Brookings Institution, 1989.

Up from the Ashes: The U.S. Minimill Steel Industry. (With Donald F. Barnett), Washington, DC: The Brookings Institution, 1986.

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"Why Is the Cost of Environmental Regulation So High?" Center for the Study of American Business. St. Louis: Washington University, Policy Study No. 110, February 1992.

"Liberalization Without Deregulation: Telecommunications Policy During the 1980s," Contemporary Policy Issues, October 1991.

"Halfway Home: U.S. Telecommunications (De)Regulation in the 1970s and 1980s," in Jack High (ed.), Regulation: Economic Theory and History. Ann Arbor: The University of Michigan Press, 1991.

"Efficiency and Productivity," in Barry G. Cole (ed.), After the Breakup: Assessing the New Post-AT&T Divestiture Era. New York: Columbia University Press, 1991.

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Professor of Economics, University of California, Berkeley, 1991-
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PREVIOUS POSITIONS:

Chief Economist, Federal Communications Commission, Jan. 1996-June 1997.
Associate Professor, University of California, Berkeley, 1989-91.
National Fellow, Hoover Institution, Stanford University, 1988-9.
Visiting Assistant Professor, University of California, Berkeley, 1986-8.
Principal Member, Technical Staff, GTE Laboratories, 1985-6.
Senior Member, Technical Staff, GTE Laboratories, 1984-85.
Assistant Professor of Economics, MIT, 1980-84.
Instructor, MIT, 1979-80.
Visiting Assistant Professor, University of California, San Diego, 1983.

EDUCATION:

D.Phil., economics, Oxford University, 1981.
  Thesis title, "Prices as Signals of Quality."
  Advisors: J.A. Mirrlees and J.E. Stiglitz.
M.Sc., mathematics, Oxford University, 1976.
  Advisors: M.F. Atiyah and P.M. Neumann.
B.A., mathematics, First Class Honors, Oxford University, 1975.

TEACHING EXPERIENCE:

Oxford University (tutorials), Massachusetts Institute of Technology, University of California at Berkeley and at San Diego. Taught courses including graduate and undergraduate industrial organization, regulation and antitrust, competitive strategy, microeconomics, statistical decision theory, and game theory.

PUBLISHED AND FORTHCOMING RESEARCH PAPERS:

"Standardization, Compatibility and Innovation," *Rand Journal of Economics* **16** (Spring 1985) 70-83 (with G. Saloner). Reprinted in *The Economics of Information*, Steven Lippman and David K. Levine, eds., International Library of Critical Writings in Economics series, Cheltenham, UK: Edward Elgar Publishing.

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OTHER PROFESSIONAL PUBLICATIONS

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SOLICITED PAPERS UNDER PREPARATION (tentative titles)

"Competition with Network Effects or Lock-In", for Volume 3 of *Handbook of Industrial Organization* (with P. Klemperer).

"Telecommunications", for Volume 3 of *Handbook of Industrial Organization* (with R. Noll).

OTHER UNPUBLISHED PAPERS

"Choosing the Rules for Formal Standardization" (second revise-and-resubmit, *Rand Journal*).

"Renegotiation in Repeated Oligopoly Games"

"Competition and Productive Efficiency" (draft) (with S. Borenstein).

"Do Investors Forecast Fat Firms? Diagnosing Profit Dissipation from Stock Market Values of Gold Mining Firms" (with S. Borenstein).

PROFESSIONAL ACTIVITIES:

President, Industrial Organization Society, 1996.

North American Editor (jointly with S. Borenstein), *Journal of Industrial Economics*, since 1995. See http://www.haas.berkeley.edu/~jindec

Refereeing for *American Economic Review, Bell Journal of Economics, Econometrica, Economic Inquiry, Economica, European Journal of Operational Research, Games and Economic Behavior, Industrial and Corporate Change, Information Economics and Policy, International Economic Review, International Journal of Game Theory, International Journal of Industrial Organization, Journal of Economic Dynamics and Control, Journal of Economic Theory, Journal of Economics and Business, Journal of Economics and Management Strategy, Journal of Law and Economics, Journal of Law, Economics and Organization, Journal of Macroeconomics, Journal of Money, Credit, and Banking, Journal of Political Economy, Journal of Public Economics, Management Science, Mathematical Social Science, Oxford Economic Papers, Quarterly Journal of Economics, Quarterly Review of Economics and Business, Rand Journal of Economics, Review of Economic Studies, Theoretical Population Biology*, for Harvard University Press, MIT Press, Princeton University Press, for the Rand Corporation, the National Science Foundation, and for the UC Energy Research Group.

Affiliate, Berkeley Center for Law and Technology; Center for Regulatory Policy.

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Seminar Presentations at Barcelona, Boston University, Caltech, Calgary, Cambridge University, Columbia, University of Chicago, Harvard, Georgetown (Law School), George Washington University, LSE, MIT, Michigan, NBER, Northwestern, Norwegian School of Management, Oslo University, Oxford, Princeton, Santa Fe Institute, Stanford, Tel Aviv, Arizona, British Columbia, University of California (Berkeley, Davis, Los Angeles, San Diego, Santa Barbara, Santa Cruz), Iowa, New University of Lisbon, USC, Toronto, Toulouse, Washington, US Department of Justice, Federal Trade Commission, Canadian Bureau of Competition Policy, National Association of Attorneys General, National Research Council, OECD, World Bank, and at numerous conferences.

Television Interview, "Deep Thinking about Standards," on "High Technology with Killen and Class," cable networks, Spring 1989.
Organized the GTE Laboratories Economics Symposium, August 1985.
Organizing Committee, Fourteenth Annual Telecommunications Policy Research Conference, April 1986.
Program Committee, Econometric Society, June 1992.
Speaker, discussant, session chair at numerous conferences.
Reviewer, U. S. Office of Technology Assessment:

"Computer Software and Intellectual Property", *Finding a Balance*, 1992.
Global Standards: Building Blocks for the Future, March 1992.

Reviewer, National Academy of Sciences/National Research Council.

Witness, US Senate Judiciary Committee, hearing on "Competition in the digital age", November 4, 1997. Provided written (see above) and oral testimony.

University and departmental administrative service including service as Chair of the Graduate Committee, membership of the Personnel Committee and Undergraduate Committee, promotion and tenure committees, and *ad hoc* committees.

Consultant for US Government and private parties.

HONORS, SCHOLARSHIPS AND GRANTS

Open Scholarship in Mathematics (undergraduate) 1972-1975.
College Book Prize, 1974.
University Prize in mathematics, 1975.
Taberdar Senior Scholarship [awarded to one to two graduate students in all subjects], 1975-76.
Science Research Council Studentship, 1975-78.
Amphlett Senior Scholarship [one of six in all subjects], 1976-78.
Hulme Senior Scholarship [one of three in all subjects], 1978-79.
University Prize for best economics master's thesis, 1979.

Principal Investigator, National Science Foundation grant, "Economics of Compatibility Standards and Lock-In," 1987-89.
National Fellow, Hoover Institution, Stanford University, 1988-9.
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